

MET-2730: LEAN MANUFACTURING

Cuyahoga Community College

Viewing: MET-2730 : Lean Manufacturing

Board of Trustees:

2016-05-26

Academic Term:

Fall 2018

Subject Code

MET - Mech Eng/Manuf Ind Eng Tech

Course Number:

2730

Title:

Lean Manufacturing

Catalog Description:

Application of Lean manufacturing concepts and Lean tools in structuring industrial manufacturing processes in efforts to minimize manufacturing costs, enhance workplace safety, improve work flow, eliminate process variations, and to shorten products delivery time.

Credit Hour(s):

3

Lecture Hour(s):

2

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

MET-1230 Drawing & AutoCAD, and MET-1120 Computer Applications and Programming, and MATH-1530 College Algebra or higher; or departmental approval.

Outcomes

Course Outcome(s):

Describe Lean Enterprise concepts and explain the interaction between the Lean elements, rules, and tools.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Explain how Lean concepts can be applied to the different operational departments of a business, why the organization culture must change and why the lean process must be institutionalized.
2. Recognize how the application of Lean principles can substantially improve the operating and financial performance of any business.

Course Outcome(s):

Develop a road map and an implementation plan for Lean Manufacturing.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Explain Policy Deployment and why this is a critical part of any Lean implementation process.
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Course Outcome(s):

Apply the fundamentals of the Kaizen process to aid in Lean implementation.

Objective(s):

1. Identify the aspects of Lean implementation where Kaizen process will be appropriate.
 2. Explain how Kaizen is used to aid Lean implementation and how it is used to change the culture.
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Course Outcome(s):

Demonstrate the application of tools, concepts, and technology of Lean to develop and implement Lean Manufacturing.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Explain the concept of Design for Manufacture and Assembly and how it influences cost.
 2. Explain the concepts of 5S.
 3. Discuss Single Minute Exchange of Dies (Quick Change) effects on Lean.
 4. Explain Total Productive Maintenance (TPM)
 5. Explain Kanban and its roles in Lean implementation.
 6. Explain Visual Workplace.
 7. Discuss Error-Proofing of manufacturing systems.
 8. Explain the roles technologies of Scheduling in Lean environment.
 9. Discuss the application of Six-Sigma and how Lean Enterprise and Six-Sigma are complimentary processes that are used to improve manufacturing.
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Course Outcome(s):

Describe the role of accounting in the Lean implementation process

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Describe how Lean metrics must replace traditional metrics.
 2. Determine how metrics drive behavior
 3. Explain how cost of quality impacts business performance.
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Course Outcome(s):

Apply the concepts and tools of Lean Manufacturing to optimize the production of engineering parts.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Explain how to identify and eliminate waste in Manufacturing.
 2. Identify value added, non-value-added-but-required activities.
 3. Explain the importance of identifying the value stream, how it is mapped and how to identify the areas that require improvement.
 4. Describe the elements of Flow and Pull and how these are applied.
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Course Outcome(s):

Apply the fundamentals of Standard Work to eliminate process variation.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Explain why the limit-people-and-materials rules are important and how they are integrated with the Lean tools to eliminate waste.
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Methods of Evaluation:

1. Projects and Assignments
2. Hands-on exercises
3. Quizzes
4. Midterm exam
5. Final exam

Course Content Outline:

1. CONCEPTS
 - a.
 - b. Lean Manufacturing Defined
 - c. The Need for Lean Manufacturing
 - d. The Need for Change
 - i. Why Change?
 - ii. Benefits of Lean
 - iii. The Evolution to Lean
 - iv. Lean v. Traditional Manufacturing
 - v. Batch and Queue
 - vi. The Role of Management
 - vii. Organization Changes
 - viii. Resistance
 - ix. The Role of Education
 - e. Lean Theory
 - i. Overview
 - ii. Waste
 - iii. The Types of Waste
 - iv. Provide Value
 - v. Radical Change
 - vi. Continuous Incremental Improvement
 - f. Lean Elements
 - i. Value
 - ii. Value Stream
 - iii. Flow
 - iv. Pull
 - v. Perfection
 - g. Lean Rules
 - i. Standard Work
 - ii. Limit Material Movement
 - iii. Limit People Movement
 - iv. Educate Everyone
 - h. Lean Tools Overview
 - i. Kaizen
 - ii. 5S
 - iii. TPM
 - iv. SMED
 - v. Process Mapping
 - vi. Takt Time
 - vii. Line /Work Balancing
 - viii. Kanban
 - ix. Mistake Proofing

- x. Autorotation
- xi. DFMA
- xii. Visual Workplace
- xiii. 5 Why
- xiv. One-Piece-Flow
- xv. Spider Charts
- xvi. Spaghetti Charts
- xvii. U-Shaped/Continuous Flow Cells
- xviii. Six Sigma
- xix. Focused Factory
- i. Kaizen
 - i. Kaizen Defined
 - ii. Philosophy
 - iii. 10 Principals
 - iv. Problem Selection
 - v. Guidelines
 - vi. Value-Added, Non Value-Added, Non-Value-Added Required
 - vii. Manufacturing Kaizen
 - viii. Batch and Queue
 - ix. Manufacturing Kaizen goals
 - x. Manufacturing Kaizen aspects
 - xi. Manufacturing Kaizen presentation
 - xii. Summary
 - xiii. Administrative Kaizen
- j. Value Stream Mapping
 - i. VSM Defined
 - ii. Purpose of VSM
 - iii. Technology Used
 - iv. The Current State Map
 - v. The Future State Map
 - vi. Strategy
 - vii. Getting Started
 - viii. The Team
 - ix. Developing a VSM
 - x. VSM Approach
 - xi. Definitions and Icons
- k. SMED (Single Minute Exchange of Dies/Quick Change)
 - i. Goals
 - ii. Traditional Concepts
 - iii. Inventory
 - iv. Benefits
 - v. Rules
 - vi. Internal v. External Activities
 - vii. Methodology
 - viii. Observe and Document Current Process
 - ix. Separate Internals from Externals
 - x. Develop Plan
 - xi. Observe and Document New Process
 - xii. Standardize New Process
 - xiii. Celebrate
- l. TPM (Total Productive Maintenance)
 - i. Introduction
 - ii. Definition
 - iii. Alternatives
 - iv. Prevention Principles
 - v. Obstacles
 - vi. Types of Breakdowns

- vii. Deterioration
- viii. How TPM is Implemented
 - ix. Overall Equipment Effectiveness (OEE)
 - x. Calculating OEE
 - xi. The Six Big Losses
 - xii. Types of Maintenance
 - xiii. Preventive
 - xiv. Breakdown
 - xv. Corrective
 - xvi. Predictive
 - xvii. Maintenance Prevention
- xviii. TPM Tools
 - xix. Autonomous Maintenance
 - xx. 7 Steps to Autonomous Maintenance
 - xxi. Skills Training
 - xxii. TPM Strategy
- m. 5S
 - i. Introduction
 - ii. Definition
 - iii. Separate
 - iv. Sort
 - v. Sweep
 - vi. Standardize
 - vii. Sustain
 - viii. Safety
- n. DFMA (Design for Manufacture and Assembly)
 - i. Definition
 - ii. Traditional Approach
 - iii. Concurrent Engineering
 - iv. DFMA Principles
 - v. DFMA Rules
 - vi. Why DFMA?
 - vii. Design Techniques
 - viii. Design Process
 - ix. Design for Six Sigma Overview
 - x. DFMA Benefits
 - xi. Product Release
- o. Kanban
 - i. Introduction
 - ii. Definition
 - iii. Pull v. Push Systems
 - iv. Function
 - v. Applications
 - vi. Information Flow
 - vii. Types
 - viii. Calculations
 - ix. Information Requirements
 - x. Manufacturing Rules
 - xi. Planner Rules
 - xii. The Role of MRP
 - xiii. Electronic Systems
 - xiv. Inventory Carrying Costs
- p. Other Lean Tools
 - i. Standard Work
 - ii. Visual Workplace Management
 - iii. Error Proofing (Poka-Yoke)

- iv. Scheduling and Leveling (Heijunka)
- v. Value Selling
- q. Lean and Six Sigma Overview
- r. Lean Accounting Overview
- s. Implementing Lean
 - i. Putting it All Together
 - ii. Lean Road Map
 - iii. Policy Development
 - iv. Lean Implementation Plan
 - v. Lean Metrics
- 2. SKILLS
 - a. Analyze manufacturing processes to identify needs for lean implementation
 - b. Select lean tools needed for lean implementation
 - c. Apply lean tools to improve manufacturing systems/processes
 - d. Perform applicable calculations in lean implementation
 - e. Selecting and applying lean concepts suitable to candidate manufacturing processes
 - f. Develop lean implementation plans
 - g. Implement lean plans and evaluate manufacturing processes/systems for lean operation
- 3. ISSUES
 - a. Ensuring that prerequisites for this course are met prior enrolling for the course
 - b. Prior exposure to manufacturing systems and environment
 - c. Computer Skills

Resources

Liker, Jeffrey. *The Toyota Way to Lean Leadership: Achieving and Sustaining Excellence through Leadership Development*. 1st ED. McGraw-Hall, 2012.

Dailey, Kenneth W. *The Lean Manufacturing Employee Training Manual*. DW Publishing Co., 2006.

Meyer Stewart. *Motion and Time Study for Lean Manufacturing*. 3rd ed. Upper Saddle River, NJ: Prentice Hall, 2002.

Dailey, Kenneth W. *Lean Manufacturing Handbook*. Clifton Park: DW Publishing Co., 2003.

Hobbs, Dennis P. *Lean Manufacturing Implementation: A Complete Execution Manual for Any Size Manufacturer*. J. Ross Publishing, Inc., 2004.

Resources Other

- 1. MRP/Scheduling Software
- 2. Work measurement/Time and Motion Study Tools and software
- 3. Microsoft Word, Excel, Visual Basic.net, C Programming

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